

CETIFICATION

SDG No:

MC49271

Humacao, PR

Laboratory:

Accutest, Massachusetts

Site:

BMS, Building 5 Area, PR

Matrix:

Groundwater

SUMMARY:

Groundwater samples (Table 1) were collected on the BMSMC facility – Building 5 Area. The BMSMC facility is located in Humacao, PR. Samples were collected December 21 - 23, 2016 and were analyzed in Accutest Laboratory of Marlborough, Massachusetts that reported the data under SDG No.: MC49271. Results were validated using the following quality control criteria of the methods employed (MADEP VPH and MAPED EPH, Massachusets Department of Environmental Protection, 2004) and the latest validation guidelines (July, 2015) of the EPA Hazardous Waste Support Section. The analyses performed are shown in Table 1. Individual data review worksheets are enclosed for each target analyte group. The data sample organic data samples summary form shows for analytes results that were qualified.

In summary the results are valid and can be used for decision taking purposes.

Table 1. Samples analyzed and analysis performed

SAMPLE ID	SAMPLE DESCRIPTION	MATRIX	ANALYSIS PERFORMED
MC49271-1	BR-2	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49271-2	BR-4	Groundwater	Volatiles TPHC Ranges
MC49271-3	FB122116	AQ - Field Blank Water	Extractable TPHC Ranges Volatiles TPHC Ranges
			Extractable TPHC Ranges
MC49271-4	EB122216	AQ - Equipment Blank	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49271-5	MW-20S	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49271-6	RA-10D	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49271-6D	RA-10D MSD	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49271-6S	RA-10D MS	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49271-7	FB122216	AQ - Field Blank Water	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49271-8	RA-10S	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49271-9	MW-20D	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49271-10	EB122316	AQ - Equipment Blank	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49271-11	FB122316	AQ - Field Blank Water	Volatiles TPHC Ranges Extractable TPHC Ranges

SAMPLE ID	SAMPLE	MATRIX	ANALYSIS PERFORMED
	DESCRIPTION		
MC49271-12	MW-19	Groundwater	Volatiles TPHC Ranges
			Extractable TPHC Ranges
MC49271-13	MW-16	Groundwater	Volatiles TPHC Ranges
			Extractable TPHC Ranges

Reviewer Name:

Rafael Infante

Chemist License 1888

Signature:

Date:

January 22, 2017

Rafael Mendez LIC. | 1000 600862

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SGS Accutest LabLink@170923 08:47 12-Jan-2017

Report of Analysis

By

AF

Prep Date

n/a

Client Sample ID: BR-3

Lab Sample ID: MC49271-1

File ID

Matrix:

AQ - Ground Water

DF

1

Method:

MADEP VPH REV 1.1

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

12/29/16

Date Sampled: 12/21/16

n/a

Date Received: 12/28/16

GWX3889

Percent Solids: n/a

Prep Batch **Analytical Batch**

Run #1 Run #2

Purge Volume

WX78505.D

5.0 ml Run #1

Run #2

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.) C9- C10 Aromatics (Unadj.) C5- C8 Aliphatics C9- C12 Aliphatics	ND 11.2 12.4 ND ND	50 50 50 50 50	8.8 8.0 9.7 8.8 8.0	ug/l ug/l ug/l ug/l ug/l	JB JB
CAS No.	Surrogate Recoveries 2,3,4-Trifluorotoluene 2,3,4-Trifluorotoluene	Run# 1 84% 101%	Run# 2	Lim:		





MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

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Client Sample ID:	BR-3			
Lab Sample ID:	MC49271-1		Date Sampled:	12/21/16
Matrix:	AQ - Ground Water		Date Received:	12/28/16
Method:	MADEP EPH REV 1.1	SW846 3510C	Percent Solids:	n/a

Project: BMSMC, Building 5 Area, Puerto Rico

	File ID	DF	Analyzed	Ву	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16696.D	1	01/10/17	AP	01/03/17	OP49345	GDE928
Run #2 a	DE16679.D	1	01/09/17	AP	01/03/17	OP49345	GDE927

	Initial Volume	Final Volume	
Run #1	950 ml	2.0 ml	
Run #2	950 ml	2.0 ml	

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	ND	110	30	ug/l	
	C9-C18 Aliphatics	ND	110	18	ug/l	
	C19-C36 Aliphatics	ND	110	29	ug/l	
	C11-C22 Aromatics	ND	110	30	ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1	o-Terphenyl	69%	74%	40-1	40%	
321-60-8	2-Fluorobiphenyl	66%	73%	40-1	40%	
3386-33-2	1-Chlorooctadecane	35% b	27% b	40-1	40%	
580-13-2	2-Bromonaphthalene	71%	75%	40-1	40%	

(a) Confirmation run.

(b) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.



ND = Not detected

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J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID:

BR-4 MC49271-2

Lab Sample ID:

AQ - Ground Water

Matrix: Method:

MADEP VPH REV 1.1

Date Sampled: 12/21/16 Date Received: 12/28/16

Percent Solids: n/a

Project:

BMSMC, Building 5 Area, Puerto Rico

File ID WX78506.D DF Analyzed 1 12/29/16

Ву AF Prep Date n/a

MDL

8.8

8.0

9.7

8.8

8.0

Units

ug/l

ug/l

ug/l

ug/l

ug/l

Prep Batch n/a

Q

JB

JB

Analytical Batch GWX3889

Run #1 Run #2

Purge Volume

Run #1

5.0 ml

Run #2

Volatile TPHC Ranges

CAS No. Compound

C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.)

C9- C10 Aromatics (Unadj.) C5- C8 Aliphatics C9- C12 Aliphatics

CAS No. Surrogate Recoveries

> 2.3.4-Trifluorotoluene 2,3,4-Trifluorotoluene

Run#1

Result

ND

11.2

14.0

ND

ND

85%

99%

Run#2

RL

50

50

50

50

50

Limits

70-130% 70-130%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID: BR-4

Lab Sample ID: MC49271-2

Matrix:

AQ - Ground Water

MADEP EPH REV 1.1 SW846 3510C

Date Sampled: 12/21/16 Date Received: 12/28/16

Method: Project:

BMSMC, Building 5 Area, Puerto Rico

Percent Solids: n/a

	File ID	DF	Analyzed	Ву	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16697.D	1	01/10/17	AP	01/03/17	OP49345	GDE928
Run #2 a	DE16680.D	1	01/09/17	AP	01/03/17	OP49345	GDE927

	Initial Volume	Final Volume
Run #1	920 ml	2.0 ml
Run #2	920 ml	2.0 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	ND	110	31	ug/l	
	C9-C18 Aliphatics	ND	110	18	ug/l	
	C19-C36 Aliphatics	ND	110	29	ug/l	
	C11-C22 Aromatics	ND	110	31	ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1	o-Terphenyl	56%	55%	40-1	40%	
321-60-8	2-Fluorobiphenyl	68%	70%	40-1	40%	
3386-33-2	1-Chlorooctadecane	24% b	19% b	40-1	40%	

(a) Confirmation run.

(b) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanal



E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

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Client Sample ID: Lab Sample ID:

FB122116 MC49271-3

Matrix: Method:

Project:

AQ - Field Blank Water

MADEP VPH REV 1.1

BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/21/16

Date Received: 12/28/16

Percent Solids: n/a

File ID DF Analyzed Prep Date Prep Batch **Analytical Batch** By Run #1 GWX3889 WX78508.D 12/29/16 AF n/a n/a

Run #2

Purge Volume

Run #1 Run #2

5.0 ml

Volatile TPHC Ranges

RL CAS No. Compound Result **MDL** Units Q C5- C8 Aliphatics (Unadj.) ND 50 8.8 ug/l C9- C12 Aliphatics (Unadj.) 8.0 JΒ 10.3 50 ug/l C9- C10 Aromatics (Unadj.) 50 13.1 9.7 JB ug/l C5- C8 Aliphatics ND 50 8.8 ug/l C9- C12 Aliphatics ND 50 8.0 ug/l

CAS No. Surrogate Recoveries Run#1 Run#2 Limits

> 2,3,4-Trifluorotoluene 85% 70-130% 2,3,4-Trifluorotoluene 100% 70-130%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID: FB122116 Lab Sample ID:

MC49271-3

Matrix: Method:

AQ - Field Blank Water

MADEP EPH REV 1.1 SW846 3510C

BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/21/16

Date Received: 12/28/16

Percent Solids: n/a

File ID Ву DF Analyzed Prep Date Prep Batch **Analytical Batch** Run #1 DE16698.D 1 01/10/17 AP 01/03/17 OP49345 **GDE928**

Run #2

Project:

Initial Volume

920 ml

Final Volume 2.0 ml

Run #1

Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics	ND ND	110 110	31 18	ug/l ug/l	
	C19-C36 Aliphatics	ND	110	29	ug/l	
	C11-C22 Aromatics	ND	110	31	ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1	o-Terphenyl	70%		40-1	40%	
321-60-8	2-Fluorobiphenyl	62%		40-1	40%	
3386-33-2	1-Chlorooctadecane	44%		40-1	40%	
580-13-2	2-Bromonaphthalene	66%		40-1	40%	
	-					



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Client Sample ID: EB122216 Lab Sample ID:

MC49271-4

Matrix: Method:

AQ - Equipment Blank MADEP VPH REV 1.1

Project:

BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/22/16

Date Received: 12/28/16

Percent Solids: n/a

	File ID	DF	Analyzed	Ву	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78509.D	1	12/29/16	AF	n/a ¯	n/a	GWX3889
Run #2							

Purge Volume

Run #1 Run #2 5.0 ml

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.)	ND 9.2	50 50	8.8 8.0	ug/l	τD
	C9- C10 Aromatics (Unadj.)	13.1	50	9.7	ug/l ug/l	JB JB
	C5- C8 Aliphatics	ND	50	8.8	ug/l	•
	C9- C12 Aliphatics	ND	50	8.0	ug/i	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
	2,3,4-Trifluorotoluene	85%		70-1	30%	
	2,3,4-Trifluorotoluene	101%		70-1	30%	



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E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

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Report of Analysis

Client Sample ID: EB122216 Lab Sample ID: MC49271-4

File ID

DE16699.D

Matrix: AQ - Equipment Blank

Method: Project:

MADEP EPH REV 1.1 SW846 3510C

BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/22/16 Date Received: 12/28/16

Percent Solids: n/a

Analyzed Ву Prep Date Prep Batch Analytical Batch **GDE928** 01/10/17 AP 01/03/17 OP49345

Run #1 Run #2

Initial Volume Final Volume Run #1 940 ml 2.0 ml

DF

1

Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Ç
	C11-C22 Aromatics (Unadj.)	ND	110	30	ug/l	
	C9-C18 Aliphatics	ND	110	18	ug/l	
	C19-C36 Aliphatics	ND	110	29	ug/l	
	C11-C22 Aromatics	ND	110	30	ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1	o-Terphenyl	68%		40-1	40%	
321-60-8	2-Fluorobiphenyl	66%		40-1	40%	
3386-33-2	1-Chlorooctadecane	42%		40-1	40%	
580-13-2	2-Bromonaphthalene	71%		40-1	40%	
						/ 4



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

By

AF

Page 1 of 1

Client Sample ID: MW-20S Lab Sample ID:

MC49271-5

AQ - Ground Water

Date Sampled: 12/22/16

Matrix: Method:

MADEP VPH REV 1.1

DF

1

Date Received: 12/28/16 Percent Solids: n/a

n/a

Q

JB

JB

GWX3889

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

12/29/16

Prep Batch **Analytical Batch**

Run #1 Run #2

Purge Volume

Run #1

5.0 ml

File ID

WX78507.D

Run #2

Volatile TPHC Ranges

CAS No. Compound

C5- C8 Aliphatics (Unadj.) ND C9- C12 Aliphatics (Unadj.) 9.7

50 8.8 50 8.0 50

RL

50

50

ug/l ug/l

Units

Prep Date

n/a

MDL

9.7 ug/l 8.8 ug/l 8.0

ug/l

CAS No.

Surrogate Recoveries

C5- C8 Aliphatics

C9- C12 Aliphatics

C9- C10 Aromatics (Unadj.)

Run#1

Result

13.6

ND

ND

Run#2

Limits

2,3,4-Trifluorotoluene 2,3,4-Trifluorotoluene 84% 100% 70-130% 70-130%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

Page 1 of 1

Client Sample ID: MW-20S Lab Sample ID: MC49271-5

Matrix: AQ - Ground Water Method:

MADEP EPH REV 1.1 SW846 3510C

Date Sampled: 12/22/16 Date Received: 12/28/16

Percent Solids: n/a

BMSMC, Building 5 Area, Puerto Rico Project:

	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16700.D	1	01/10/17	AP	01/03/17	OP49345	GDE928
Run #2 a	DE16683.D	1	01/09/17	AP	01/03/17	OP49345	GDE927

	Initial Volume	Final Volume
Run #1	920 ml	2.0 ml
Run #2	920 ml	2.0 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics	ND ND	110 110	31 18	ug/l ug/l	
	C19-C36 Aliphatics	ND	110	29	ug/l	
	C11-C22 Aromatics	ND	110	31	ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1	o-Terphenyl	50%	55%	40-1	40%	
321-60-8	2-Fluorobiphenyl	66%	74%	40-1	40%	
3386-33-2	1-Chlorooctadecane	27% b	15% b	40-1	40%	
580-13-2	2-Bromonaphthalene	70%	77%	40-1	40%	

(a) Confirmation run.

(b) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

AF

Page 1 of 1

Client Sample ID: RA-10D Lab Sample ID:

MC49271-6

Date Sampled: 12/22/16

Matrix:

AO - Ground Water MADEP VPH REV 1.1

1

Date Received: 12/28/16

Method: Project:

BMSMC, Building 5 Area, Puerto Rico

Percent Solids: n/a

Run #1

DF Analyzed By

12/29/16

Analytical Batch Prep Batch GWX3889 n/a

Run #2

Purge Volume

WX78496.D

Run #1

5.0 ml

File ID

Run #2

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	19.7	50	8.8	ug/l	J
	C9- C12 Aliphatics (Unadj.)	96.4	50	8.0	ug/l	В
	C9- C10 Aromatics (Unadj.)	57.5	50	9.7	ug/l	В
	C5- C8 Aliphatics	13.4	50	8.8	ug/l	J
	C9- C12 Aliphatics	37.8	50	8.0	ug/l	J

CAS No.

Surrogate Recoveries

Run#2

Limits

Prep Date

n/a

2,3,4-Trifluorotoluene 2,3,4-Trifluorotoluene 88% 98%

Run#1

70-130% 70-130%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID:	RA-10D			
Lab Sample ID:	MC49271-6		Date Sampled:	12/22/16
Matrix:	AQ - Ground Water		Date Received:	12/28/16
Method:	MADEP EPH REV 1.1	SW846 3510C	Percent Solids:	n/a

BMSMC, Building 5 Area, Puerto Rico Project:

	File ID	DF	Analyzed	Ву	Prep Date	Prep Batch	Analytical Batch
Run #1	DE16707.D	1	01/10/17	AP	01/03/17	OP49345	GDE928
Run #2 a	DE16685.D	1	01/09/17	AP	01/03/17	OP49345	GDE927

	Initial Volume	Final Volume
Run #1	950 ml	2.0 ml
Run #2	950 ml	2.0 ml

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics C19-C36 Aliphatics C11-C22 Aromatics	48.6 ND ND 48.6	110 110 110 110	30 18 29 30	ug/l ug/l ug/l ug/l	J J
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1 321-60-8 3386-33-2 580-13-2	o-Terphenyl 2-Fluorobiphenyl 1-Chlorooctadecane 2-Bromonaphthalene	64% 67% 39% ^b 70%	65% 70% 19% ^b 74%	40-1 40-1 40-1 40-1	40% 40%	

(a) Confirmation run.

(b) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Client Sample ID: FB122216 Lab Sample ID: MC49271-7

Matrix: AQ - Field Blank Water Method: MADEP VPH REV 1.1

2,3,4-Trifluorotoluene

Project: BMSMC, Building 5 Area, Puerto Rico Date Sampled: 12/22/16 Date Received: 12/28/16

Percent Solids: n/a

	File ID	DF	Analyzed	Ву	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78510.D	1	12/29/16	AF	n/a	n/a	GWX3889
D.m #2							

Purge Volume

5.0 ml

Run #1 Run #2

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	9.8	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	12.5	50	9.7	ug/l	JB
	C5- C8 Aliphatics	ND	50	8.8	ug/l	
	C9- C12 Aliphatics	ND	50	8.0	ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run#2	Lim	its	
	2,3,4-Trifluorotoluene	87%		70-1	.30%	

101%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

70-130%

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID: FB122216 Lab Sample ID: MC49271-7

Matrix: AQ - Field Blank Water Method:

MADEP EPH REV 1.1 SW846 3510C BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/22/16 Date Received: 12/28/16

Percent Solids: n/a

Project:

Analytical Batch File ID DF Prep Date Prep Batch Analyzed By OP49345 **GDE928** DE16708.D 01/10/17 AP 01/03/17 Run #1 1

Run #2

Initial Volume Final Volume

2-Bromonaphthalene

Run #1 980 ml 2.0 ml

Run #2

580-13-2

Extractable TPHC Ranges

CAS No.		Compound	Result	RL	MDL Units		Q
		C11-C22 Aromatics (Unadj.)	ND	100	29	ug/l	
		C9-C18 Aliphatics	ND	100	17	ug/l	
		C19-C36 Aliphatics	ND	100	28	ug/l	
		C11-C22 Aromatics	ND	100	29	ug/l	
	CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
	84-15-1	o-Terphenyl	72%		40-1	40%	
	321-60-8	2-Fluorobiphenyl	61%		40-1	40%	
	3386-33-2	1-Chlorooctadecane	53%		40-1	40%	

65%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

40-140%

B = Indicates analyte found in associated method blank



Report of Analysis

By

AF

Prep Date

n/a

Page 1 of 1

Client Sample ID: RA-10S

Lab Sample ID: MC49271-8

File ID

Matrix: Method: AQ - Ground Water

DF

1

MADEP VPH REV 1.1

Date Received: 12/28/16

Q

JB JB

Date Sampled: 12/22/16

Percent Solids: n/a

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

12/29/16

Prep Batch **Analytical Batch** n/a GWX3889

Run #1 Run #2

Purge Volume

WX78502.D

Run #1 5.0 ml

Run #2

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l
	C9- C12 Aliphatics (Unadj.)	19.9	50	8.0	ug/l
	C9- C10 Aromatics (Unadj.)	14.4	50	9.7	ug/l
	C5- C8 Aliphatics	ND	50	8.8	ug/l
	C9- C12 Aliphatics	ND	50	8.0	ug/l
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its
	2,3,4-Trifluorotoluene	89%		70-1	30%
	2,3,4-Trifluorotoluene	102%		70-1	30%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID: RA-10S

Lab Sample ID: MC49271-8

Matrix: Method:

AQ - Ground Water

MADEP EPH REV 1.1 SW846 3510C

Analyzed

01/10/17

Date Sampled: 12/22/16

Date Received: 12/28/16

Percent Solids: n/a

OP49345

Q

01/03/17

Project: BMSMC, Building 5 Area, Puerto Rico

DF

1

Prep Date Prep Batch

Analytical Batch GDE928

AP

By

Run #1 Run #2

Initial Volume 940 ml

File ID

DE16709.D

Final Volume 2.0 ml

Run #1 Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units
	C11-C22 Aromatics (Unadj.)	ND	110	30	ug/l
	C9-C18 Aliphatics	ND	110	18	ug/l
	C19-C36 Aliphatics	ND	110	29	ug/l
	C11-C22 Aromatics	ND	110	30	ug/l
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its
84-15-1	o-Terphenyl	71%		40-1	40%
321-60-8	2-Fluorobiphenyl	66%		40-1	40%
3386-33-2	1-Chlorooctadecane	52%		40-1	40%
580-13-2	2-Bromonaphthalene	70%		40-1	40%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID: MW-20D

Lab Sample ID: MC49271-9

Matrix:

Method:

Project:

AQ - Ground Water

MADEP VPH REV 1.1 BMSMC, Building 5 Area, Puerto Rico Date Sampled: 12/22/16

Date Received: 12/28/16

Percent Solids: n/a

	File ID	DF	Analyzed	Ву	Prep Date	Prep Batch	Analytical Batch
Run #1	WX78503.D	1	12/29/16	AF	n/a	n/a	GWX3889
Run #2							

Purge Volume 5.0 ml

Run #1

Run #2

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.) C9- C10 Aromatics (Unadj.) C5- C8 Aliphatics	28.5 11.4 13.1 19.4	50 50 50 50	8.8 8.0 9.7 8.8	ug/l ug/l ug/l ug/l	J JB JB I
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
	2,3,4-Trifluorotoluene	86%		70-130%
	2.3.4-Trifluorotoluene	100%		70-130%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID: MW-20D Lab Sample ID: MC49271-9

Matrix: Method:

AQ - Ground Water

MADEP EPH REV 1.1 SW846 3510C BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/22/16

Date Received: 12/28/16

Percent Solids: n/a

File ID **Analytical Batch** DF Analyzed By Prep Date Prep Batch 01/03/17 **GDE927** DE16688.D 01/09/17 AP **OP49345** Run #1 1

Run #2

Project:

Initial Volume Final Volume 1000 ml 2.0 ml

Run #1

Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics C19-C36 Aliphatics C11-C22 Aromatics	32.9 ND ND 32.9	100 100 100 100	29 17 27 29	ug/l ug/l ug/l ug/l	J J

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
84-15-1	o-Terphenyl	79%		40-140%
321-60-8	2-Fluorobiphenyl	71%		40-140%
3386-33-2	1-Chlorooctadecane	45%		40-140%
580-13-2	2-Bromonaphthalene	75%		40-140%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID: EB122316

Lab Sample ID:

MC49271-10

Matrix:

AQ - Equipment Blank

DF

1

MADEP VPH REV 1.1

Method: Project:

BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/23/16

Date Received:

12/28/16

Percent Solids: n/a

Run #1

File ID WX78511.D Analyzed 12/29/16

By AF

RL

50

50

50

50

50

Prep Date n/a

MDL

8.8

8.0

9.7

8.8

8.0

Prep Batch n/a

Q

JB

JB

Units

ug/l

ug/l

ug/l

ug/l

ug/l

Analytical Batch GWX3889

Run #2

Purge Volume

Run #1 Run #2

CAS No.

Volatile TPHC Ranges

5.0 ml

CAS No. Compound

C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.) C9- C10 Aromatics (Unadj.)

C5- C8 Aliphatics C9- C12 Aliphatics

Surrogate Recoveries

2,3,4-Trifluorotoluene

2,3,4-Trifluorotoluene 85%

Run# 1 Run#2

Result

ND

8.9

13.0

ND

ND

101%

70-130% 70-130%

Limits

Méndez 10 # 1886

ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID: EB122316 Lab Sample ID: MC49271-10

File ID

Matrix:

Method:

AQ - Equipment Blank

MADEP EPH REV 1.1 SW846 3510C

Date Sampled: 12/23/16 Date Received: 12/28/16

Percent Solids: n/a

Project: BMSMC, Building 5 Area, Puerto Rico

Run #1 Run #2

DF DE16710.D 1

Analyzed Ву 01/10/17 AP Prep Date 01/03/17

Prep Batch

Analytical Batch

OP49345 GDE928

Initial Volume Final Volume 940 ml

Run #1

2.0 ml

Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	ND	110	30	ug/l	
	C9-C18 Aliphatics	ND	110	18	ug/l	
	C19-C36 Aliphatics	ND	110	29	ug/l	
	C11-C22 Aromatics	ND	110	30	ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1	o-Terphenyl	83%		40-1	40%	
321-60-8	2-Fluorobiphenyl	74%		40-1	40%	
3386-33-2	1-Chlorooctadecane	51%		40-1	40%	
580-13-2	2-Bromonaphthalene	81%		40-1	40%	/



ND = Not detected

MDL = Method Detection Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

By

AF

n/a

Page 1 of 1

Client Sample ID: FB122316 Lab Sample ID: MC49271-11

Matrix:

Method:

AQ - Field Blank Water

Date Received:

Date Sampled: 12/23/16 12/28/16

MADEP VPH REV 1.1

Percent Solids:

n/a

Project: BMSMC, Building 5 Area, Puerto Rico

DF

1

Prep Batch Prep Date

Analytical Batch GWX3889

Run #1 Run #2

Purge Volume

Run #1 Run #2 5.0 ml

File ID

WX78512.D

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	10.2	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	12.4	50	9.7	ug/l	JB
	C5- C8 Aliphatics	ND	50	8.8	ug/l	
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

Analyzed

12/29/16

CAS No. Surrogate Recoveries Run# 1 Run#2 Limits

> 89% 2,3,4-Trifluorotoluene 70-130% 2,3,4-Trifluorotoluene 101% 70-130%



ND = Not detected

MDL = Method Detection Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Page 1 of 1

Client Sample ID: FB122316 Lab Sample ID:

MC49271-11

Matrix:

AQ - Field Blank Water

MADEP EPH REV 1.1 SW846 3510C BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/23/16

Q

Date Received: 12/28/16

Percent Solids: n/a

File ID DF Analyzed By Prep Date Prep Batch **Analytical Batch** Run #1 DE16690.D 1 01/10/17 AP 01/03/17 OP49345 **GDE927**

Run #2

Method:

Project:

Initial Volume 970 ml

Final Volume 2.0 ml

Run #1 Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units
	C11-C22 Aromatics (Unadj.)	ND	100	30	ug/l
	C9-C18 Aliphatics	ND	100	17	ug/l
	C19-C36 Aliphatics	ND	100	28	ug/l
	C11-C22 Aromatics	ND	100	30	ug/l
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its
84-15-1	o-Terphenyl	94%		40-1	40%
321-60-8	2-Fluorobiphenyl	75%		40-1	40%
3386-33-2	1-Chlorooctadecane	60%		40-1	40%
580-13-2	2-Bromonaphthalene	79%		40-1	40%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Page 1 of 1

Client Sample ID: MW-19

Lab Sample ID: MC49271-12

Matrix:

AQ - Ground Water

Date Received: 12/28/16

Date Sampled: 12/23/16

Method:

MADEP VPH REV 1.1

Percent Solids: n/a

Project:

BMSMC, Building 5 Area, Puerto Rico

	File ID	DF	Analyzed	Ву	Prep Date	Prep Batch	Analytical Batch
Run	#1 WX78499.D	1	12/29/16	AF	n/a	n/a	GWX3889
Run	#2 WX78500.D	50	12/29/16	AF	n/a	n/a	GWX3889

Purge Volume

Run #1 5.0 ml Run #2 5.0 ml

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.) C9- C10 Aromatics (Unadj.) C5- C8 Aliphatics C9- C12 Aliphatics	ND 8900 ^a 68.0 ND 2430	50 2500 50 50 50	8.8 400 9.7 8.8 8.0	ug/l ug/l ug/l ug/l ug/l	В
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
	2,3,4-Trifluorotoluene 2,3,4-Trifluorotoluene	87% 98%	89% 101%		30% 30%	

(a) Result is from Run# 2



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

By

AP

Prep Date

01/03/17

Page 1 of 1

Client Sample ID: MW-19

Lab Sample ID:

MC49271-12

Date Sampled: 12/23/16 Date Received: 12/28/16

Matrix: Method: AQ - Ground Water

DF

1

Project:

MADEP EPH REV 1.1 SW846 3510C

J

Percent Solids: n/a

BMSMC, Building 5 Area, Puerto Rico

Analyzed

01/10/17

Prep Batch OP49345

Analytical Batch **GDE927**

Run #1 Run #2

Initial Volume

DE16691.D

Final Volume

Run #1

970 ml

File ID

2.0 ml

Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics	51.2 ND	100 100	30 17	ug/l ug/l	J

C9-C18 Aliphatics	ND	100	17	ug/l
C19-C36 Aliphatics	ND	100	28	ug/l
C11-C22 Aromatics	45.7	100	30	ug/l

CAS No.	Surrogate Recoveries	Run# 1	Run#2	Limits
84-15-1	o-Terphenyl	64%		40-140%
321-60-8	2-Fluorobiphenyl	72%		40-140%
3386-33-2	1-Chlorooctadecane	43%		40-140%
580-13-2	2-Bromonanhthalene	76%		40-140%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID: MW-16

Lab Sample ID: MC49271-13

Matrix:

AQ - Ground Water

Date Received:

12/23/16 Date Sampled:

Method:

MADEP VPH REV 1.1

DF

1

12/28/16

Project:

BMSMC, Building 5 Area, Puerto Rico

Percent Solids:

Run #1

File ID WX78504.D Analyzed Ву 12/29/16 AF Prep Date n/a

Prep Batch n/a

Analytical Batch GWX3889

Run #2

Purge Volume

2,3,4-Trifluorotoluene

Run #1

5.0 ml

Run #2

Volatile TPHC Ranges

CAS No.	Compound
---------	----------

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	18.0	50	8.0	ug/l	JB
	C9- C10 Aromatics (Unadj.)	18.9	50	9.7	ug/l	JB
	C5- C8 Aliphatics	ND	50	8.8	ug/l	
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No.

Run#1 Run#2 Surrogate Recoveries 2,3,4-Trifluorotoluene

87% 100% 70-130% 70-130%

Limits



E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

By

AP

Page 1 of 1

Client Sample ID: MW-16

Lab Sample ID: MC49271-13

File ID

DE16711.D

Matrix:

AQ - Ground Water

DF

1

Prep Date

01/03/17

Date Sampled: 12/23/16 Date Received: 12/28/16

Method:

MADEP EPH REV 1.1 SW846 3510C

Percent Solids: n/a

Prep Batch

OP49345

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

01/10/17

Q

Analytical Batch

GDE928

Run #1 Run #2

> Final Volume Initial Volume

Run #1

1000 ml

2.0 ml

Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Unit
	C11-C22 Aromatics (Unadj.)	ND	100	29	ug/l
	C9-C18 Aliphatics	ND	100	17	ug/l
	C19-C36 Aliphatics	ND	100	27	ug/l
	C11-C22 Aromatics	ND	100	29	ug/l
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its
84-15-1	o-Terphenyl	67%		40-1	40%
321-60-8	2-Fluorobiphenyl	69%		40-1	40%
3386-33-2	1-Chlorooctadecane	41%		40-1	40%
580-13-2	2-Bromonaphthalene	73%		40-1	40%





MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Page 1 of 1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC49271

Account:

AMANYWP Anderson Mulholland and Assoc.

Project:

BMSMC, Building 5 Area, Puerto Rico

Sample File ID DF Analyzed By Prep Date Prep Batch Analytical B MC49271-6MS WX78497.D 1 12/29/16 AF n/a n/a GWX3889 MC49271-6MSD WX78498.D 1 12/29/16 AF n/a n/a GWX3889 MC49271-6 WX78496.D 1 12/29/16 AF n/a n/a GWX3889
--

The QC reported here applies to the following samples:

Method: MADEP VPH REV 1.1

MC49271-1, MC49271-2, MC49271-3, MC49271-4, MC49271-5, MC49271-6, MC49271-7, MC49271-8, MC49271-9, MC49271-10, MC49271-11, MC49271-12, MC49271-13

98%

CAS No.	Compound	MC4927 ug/l	1-6 Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD	
	C5- C8 Aliphatics (Unadj.)	19.7	j	300	417	133* a	300	421	134* a	1	70-130/25	
	C9- C12 Aliphatics (Unadj.)	96.4	В	450	591	124	450	596	125	1	70-130/25	
	C9- C10 Aromatics (Unadj.)	57.5	В	150	175	78	150	174	78	1	70-130/25	
CAS No.	Surrogate Recoveries	MS		MSD	М	C49271-6	Limits					
	2,3,4-Trifluorotoluene	88%		88%	88	1%	70-1309	6				

102%

(a) Outside control limits due to possible matrix interference.

102%

2,3,4-Trifluorotoluene



70-130%

^{* =} Outside of Control Limits.

Matrix Spike/Matrix Spike Duplicate Summary

Job Number:

MC49271

Account:

AMANYWP Anderson Mulholland and Assoc.

Project:

BMSMC, Building 5 Area, Puerto Rico

Sample OP49345-MS OP49345-MSD	File ID DE16677.D DE16678.D	DF 1 1	Analyzed 01/09/17 01/09/17	By AP AP	Prep Date 01/03/17 01/03/17	Prep Batch OP49345 OP49345	Analytical Batch GDE927 GDE927
MC49271-6 a	DE16685.D	1	01/09/17	AP	01/03/17	OP49345	GDE927
MC49271-6	DE16707.D	1	01/10/17	AP	01/03/17	OP49345	GDE928

The QC reported here applies to the following samples:

Method: MADEP EPH REV 1.1

Page 1 of 1

MC49271-1, MC49271-2, MC49271-3, MC49271-4, MC49271-5, MC49271-6, MC49271-7, MC49271-8, MC49271-9, MC49271-10, MC49271-11, MC49271-12, MC49271-13

CAS No.	Compound	MC4927 ug/l	'1-6 Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics C19-C36 Aliphatics	48.6 b ND b ND b	J	851 319 426	603 142 290	64 44 68	842 316 421	619 160 313	67 51 74	3 12 8	40-140/25 40-140/25 40-140/25
CAS No.	Surrogate Recoveries	MS		MSD	M	C49271-6	MC492	71-6 Lin	nits		
84-15-1 321-60-8 3386-33-2 580-13-2	o-Terphenyl 2-Fluorobiphenyl 1-Chlorooctadecane 2-Bromonaphthalene	78% 81% 41% 83%		85% 79% 51% 81%	70 19	5% 0% 0%* ^c 1%	64% 67% 39%* c 70%	40- 40-	140% 140% 140% 140%		

- (a) Confirmation run.
- (b) Result is from Run #2.
- (c) Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.



^{* =} Outside of Control Limits.

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CHAIN OF CUSTODY

PAGE	1	OF	2
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Page 1 of 4

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CHAIN OF CUSTODY

PAGE	2 OF	2

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EXECUTIVE NARRATIVE

SDG No: MC49271 Laboratory: Accutest, Massachusetts

Analysis: MADEP VPH Number of Samples: 15

Location: BMSMC, Building 5 Area

Humacao, PR

SUMMARY: Fifth teen (15) samples were analyzed for Volatiles TPHC Ranges by method MADEP

VPH. Samples were validated following the METHOD FOR THE DETERMINATION OF VOLATILE PETROLEUM HYDROCARBONS (VPH) quality control criteria, Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the

primary guidance document, unless otherwise noted.

Results are valid and can be used for decision making purposes.

Critical issues: None Major: None Minor: None

Critical findings: None Major findings: None

Minor findings: 1. Continuing and final calibration verification meets method specific requirements except

in the cases described in this document. The % difference for VPH in the rt7/10 retention time window in the continuing and ending calibration verification was outside the method

performance criteria. Results are qualified as estimated in affected samples.

2. Target analytes detected in the method and field/equipment blanks. Laboratory qualified positive results with a B qualifier. Target analytes detected below the reporting limit are qualified as non-detected (U). Results for target analytes detected above the reporting

limits are retained.

3. MS/MSD % recovery and RPD outside laboratory control limits in sample MC49271-6

for C5-C8 Aliphatics (Unadj.). Results qualified as estimated (J) in affected sample.

COMMENTS: Results are valid and can be used for decision making purposes.

Reviewers Name: Rafael Infante

Chemist License 1888

Signature: Rafuel Infant

Date: January 22, 2017

SAMPLE ORGANIC DATA SAMPLE SUMMARY

Sample ID: MC49271-1

Sample location: BMSMC Building 5 Area

Sampling date: 12/21/2016 Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics (Unadj.)	9.1	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	10.7	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample ID: MC49271-2

Sample location: BMSMC Building 5 Area

Sampling date: 12/21/2016 Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics (Unadj.)	11.2	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	14.0	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample ID: MC49271-3

Sample location: BMSMC Building 5 Area

Sampling date: 12/21/2016

Matrix: AQ - Field Blank Water

METHOD: MADEP VPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics (Unadj.)	10.3	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	13.1	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample ID: MC49271-4

Sample location: BMSMC Building 5 Area

Sampling date: 12/22/2016

Matrix: AQ - Equipment Blank

METHOD: MADEP VPH

Analyte Name	Result	Units Dil	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics (Unadj.)	9.2	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	13.1	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample ID: MC49271-5

Sample location: BMSMC Building 5 Area

Sampling date: 12/22/2016 Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics (Unadj.)	9.7	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	13.6	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample ID: MC49271-6

Sample location: BMSMC Building 5 Area

Sampling date: 12/22/2016 Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	19.7	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	96.4	ug/L	1	В	-	Yes
Ç9 - C10 Aromatics (Unadj.)	57.5	ug/L	1	В	-	Yes
Ç5 - C8 Aliphatics	13.4	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	37.8	ug/L	1	J	J	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/22/2016

Matrix: AQ - Field Blank Water

METHOD: MADEP VPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics (Unadj.)	9.8	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	12.5	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample ID: MC49271-8

Sample location: BMSMC Building 5 Area

Sampling date: 12/22/2016 Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics (Unadj.)	19.9	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	14.5	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/22/2016 Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	28.5	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	11.4	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	13.1	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	19.4	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample ID: MC49271-10

Sample location: BMSMC Building 5 Area

Sampling date: 12/23/2016

Matrix: AQ - Equipment Blank

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics (Unadj.)	8.9	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	13.0	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/23/2016

Matrix: AQ - Field Blank Water

METHOD: MADEP VPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics (Unadj.)	10.2	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	12.4	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample ID: MC49271-12

Sample location: BMSMC Building 5 Area

Sampling date: 12/23/2016 Matrix: Groundwater

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics (Unadj.)	8900	ug/L	1	-	J	Yes
Ç9 - C10 Aromatics (Unadj.)	68.0	ug/L	1	В	-	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics	2430	ug/L	1	-	J	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/23/2016 Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics (Unadj.)	18.0	ug/L	1	JB	U	Yes
Ç9 - C10 Aromatics (Unadj.)	18.9	ug/L	1	JB	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	U	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	UJ	Yes

Sample ID: MC49271-6MS

Sample location: BMSMC Building 5 Area

Sampling date: 12/23/2016 Matrix: Groundwater

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	417	ug/L	1	-	-	Yes
Ç9 - C12 Aliphatics (Unadj.)	591	ug/L	1	-	J	Yes
Ç9 - C10 Aromatics (Unadj.)	175	ug/L	1	-	-	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/23/2016 Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	421	ug/L	1	-	-	Yes
Ç9 - C12 Aliphatics (Unadj.)	596	ug/L	1	-	J	Yes
Ç9 - C10 Aromatics (Unadj.)	174	ug/L	1	-	-	Yes

DATA REVIEW WORKSHEETS

Type of vali	dation	Full:X	Project N	Jumber M	1C49271	
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			EPA Reg	gion:	_2	
REV	IEW OF V	OLATILE PETROLE	UM HYDR	OCARBO	N (VPHs) P	ACKAGE
actions. This informed dec assessed ac METHOD FO Massachuse validation gu criteria and	s document cision and cording to to DR THE D tts Departnuidelines produced	for evaluating volatile of will assist the review in better serving the received he data validation guida ETERMINATION OF When of Environmental omulgated by the USI ation actions listed on less otherwise noted.	wer in using needs of the ance docum OLATILE Protection EPA Hazar	ng professione data usonents in the PETROLEL, Revision rdous Wasi	onal judgme ers. The sale following or JM HYDRO0 1.1 (2004). tes Support	ent to make more mple results were der of precedence CARBONS (VPH), Also the general Section. The QC
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X Bla X Sur	ding Times /MS Tuning rnal Standa nks rogate Rec	ard Performance	XF XC	ield Duplica	dentifications Quantitation	
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Reviewer: Date:	January_22	2,_2017			-	

	Criteria we	ere not met and/or see below	-
. DATA COMPLETNE A. Data Package			
MISSING INFORMATION	DATE LAB. CONTACTED	DATE RECEIVED	
3. Other		Discrepancies	•
_37			

All criteria were met	_X
Criteria were not met and/or see below	

HOLDING TIMES

The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of extraction, and subsequently from the time of extraction to the time of analysis.

Complete table for all samples and note the analysis and/or preservation not within criteria

SAMPLE ID	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	ACTION
Samples ana		nod recommende ithin the required		ample preservation

Criteria

Preservation:

Samples analyzed with ambient purge temperature: Samples must be acidified to a pH of 2.0 or less at the time of collection.

Samples analyzed with heated purge temperature: Samples must be treated to a pH of 11.0 or greater at the time of collection.

Methanol preservation of soil/sediment samples is mandatory. Methanol (purgeand-trap grade) must be added to the sample vial before or immediately after sample collection. In lieu of the in-field preservation of samples with methanol, soil samples may be obtained in specially-designed air tight sampling devices, provided that the samples are extruded and preserved in methanol within 48 hours of collection.

Holding times:

Aqueous samples using ambient or heated purge - analyze within 14 days. Soil/sediment samples - analysis within 28 days.

ooler temperature	(Criteria: 4	4 + 2 °C): 2.9°C	
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Actions: Qualify positive results/non-detects as follows:

If holding times are exceeded, estimate positive results (J) and nondetects (UJ).

If holding times are grossly exceeded, use professional judgment to qualify data. The data reviewer may choose to estimate positive results (J) and rejects nondetects (R).

If samples were not at the proper temperature (> 10°C) or improperly preserved, use professional judgment to qualify the results.

		C	All criteria were not met an	eria were metX_ d/or see below
CALIBRATION	S VERIFIC	ATION		
			rument calibration are d maintaining acceptab	
		Date of in	itial calibration:10/	31/16
		Dates of i	nitial calibration verific	ation:10/31/16_
		Instrumer	nt ID numbers:	_GCWX
		Matrix/Le	vel:AQUEOUS/I	MEDIUM
DATE L	AB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED

Initial and initial calibration verification meet method specific requirements

Criteria- ICAL

- Five point calibration curve.
- The percent relative standard deviation (%RSD) of the calibration factor must be equal to or less than 25% over the working range for the analyte of interest. When this condition is met, linearity through the origin may be assumed, and the average calibration factor is used in lieu of a calibration curve.
- A collective calibration factor must also be established for each hydrocarbon range of interest. Calculate the collective CFs for C5-C8 Aliphatic Hydrocarbons and C9-C12 Aliphatic Hydrocarbons using the FID chromatogram. Calculate the collective CF for the C9-C10 Aromatic Hydrocarbons using the PID chromatogram. Tabulate the summation of the peak areas of all components in that fraction against the total concentration injected. The %RSD of the calibration factor must be equal to or less than 25% over the working range for the hydrocarbon range of interest.

Criteria- CCAL

- At a minimum, the working calibration factor must be verified on each working day, after every 20 samples, and at the end of the analytical sequence by the injection of a mid-level continuing calibration standard to verify instrument performance and linearity.
- If the percent difference (%D) for any analyte varies from the predicted response by more than ±25%, a new five-point calibration must be performed for that analyte. Greater percent differences are permissible for n-nonane. If the %D for n-nonane is greater than 30, note the nonconformance in the case narrative. It should be noted that the %Ds are calculated when CFs are used for the initial calibration and

DATA REVIEW WORKSHEETS

percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects.

If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration:	10/31/16
Dates of continuing calibra	tion verification:12/29/16
Dates of final calibration ve	erification:_10/31/16;_12/29/16
Instrument ID numbers:	GCWX
Matrix/Level:	AQUEOUS/MEDIUM

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, <u>%D</u> , r	SAMPLES AFFECTED
12/29/16	cc3857-50	rt7/10	-33.5 % -40.1 %	MC49271-1 to ; -13; -6MS/-6MSD

Note: Continuing and final calibration verification meets method specific requirements except in the cases described in this document. The % difference for VPH in the rt7/10 retention time window in the continuing and ending calibration verification outside the method performance criteria. Results are qualified as estimated in affected samples.

A separate worksheet should be filled for each initial curve

All criteria were met	
Criteria were not met and/or see below	Χ

V A. BLANK ANALYSIS RESULTS (Sections 1 & 2)

The assessment of the blank analysis results is to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks apply only to blanks associated with the samples, including trip, equipment, and laboratory blanks. If problems with any blanks exist, all data associated with the case must be carefully evaluated to determine whether or not there is an inherent variability in the data for the case, or if the problem is an isolated occurrence not affecting other data. A Laboratory Method Blank must be run after samples suspected of being highly contaminated to determine if sample carryover has occurred.

List the contamination in the blanks below. High and low levels blanks must be treated separately.

Laboratory blanks

DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	UNITS	RATION
_METHOD_BL			D_SPECIFIC_CRI	TERIA_EXCEF	PT_IN_THE
_12/29/160	GWX3889-MB	Aqueous/low	v_C9-C12_Aliphat C9-C10 Aroma		15.5_ug/L 18.8_ug/L

Note: Laboratory qualified positive results below the reporting limit with a B qualifier. Target analytes detected below the reporting limit are qualified as non-detected (U). Results for target analytes detected above the reporting limits are retained.

Field/Trip/Equipment

.

A methanol trip blank or acidified reagent water trip blank **should** continually accompany each soil/sediment sample or water sample batch, respectively, during sampling, storage, and analysis.

ANALYZED	LAB ID	MATRIX	COMPOUND	UNITS	ION
	_	_	_THIS_DATA_PAC JIPMENT_BLANKS		T_A
_CONCENTRAT			ORTING_LIMITS_E	XCEPT_FOR_T	THE_CASES
_12/29/16N		•	vC9-C10_Aliphat vC9-C10_Aromat	_ ·	
_12/29/16N	1C49271-4	Aqueous/lov	wC9-C10_Aliphat vC9-C10_Aromat	ics_(Unadj.)	_9.2_ug/L

ANALYZED	LAB ID	MATRIX	COMPOUND	UNITS	
_12/29/16	_MC49271-10_	_Aqueous/lo		atics_(Unadj.)8.9_ug/L	
_12/29/16	_MC49271-11_	_Aqueous/lo	w_ C9-C12_Alipha	natics_(Unadj.)13.0_ug/L natics_(Unadj.)10.2_ug/L natics (Unadj.) 13.0 ug/L	_
			00 010_711011	10.100_(01100J.)10.10_0g/L	_

Note: Laboratory qualified positive results below the reporting limit with a B qualifier. Target analytes detected below the reporting limit are qualified as non-detected (U). Results for target analytes detected above the reporting limits are retained.

V B. BLANK ANALYSIS RESULTS (Section 3)

Blank Actions

The ALs for samples which have been diluted should be corrected for the sample dilution factor and/or % moisture, where applicable. Peaks must not be detected above the Reporting Limit within the retention time window of any analyte of interest. The hydrocarbon ranges must not be detected at a concentration greater than 10% of the most stringent MCP cleanup standard. Specific actions area as follows:

If the concentration is < sample quantitation limit (SQL) and < AL, report the compound as not detected (U) at the SQL.

If the concentration is \geq SQL but < AL, report the compound as not detected (U) at the reported concentration.

If the concentration is > AL, report the concentration unqualified.

SAMPLE ID

			All c	criteria	were	met .	_X
Criteria	were	not	met	and/or	rsee	below	/

ACTION

SURROGATE SPIKE RECOVERIES

Laboratory performance of individual samples is established by evaluation of surrogate spike recoveries. All samples are spiked with surrogate compounds prior to sample analysis. The accuracy of the analysis is measured by the surrogate percent recovery. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the validation of data is frequently subjective and demands analytical experience and professional judgment.

List the percent recoveries (%Rs) which do not meet the criteria for surrogate recovery. Matrix: solid/aqueous

SURROGATE COMPOUND

2,3,4	-Trifluorotoluene	•		
_SURROGATE_STAN _LIMITS	DARD_RECOVI	ERIES_WITH	IIN_LABORATO	RY_CONTROL
2				
QC Limits* (Aqueous)LL_to_UL QC Limits* (Solid)	_70_to_130_	to	to	
LL to UL	to	to	to	

It is recommended that surrogate standard recoveries be monitored and documented on a continuing basis. At a minimum, when surrogate recovery from a sample, blank, or QC sample is less than 70% or more than 130%, check calculations to locate possible errors, check the fortifying standard solution for degradation, and check changes in instrument performance.

If the cause cannot be determined, reanalyze the sample unless one of the following exceptions applies:

- (1) Obvious interference is present on the chromatogram (e.g., unresolved complex mixture);
- (2) Percent moisture of associated soil/sediment sample is >25% and surrogate recovery is >10%; or
- (3) The surrogate exhibits high recovery and associated target analytes or hydrocarbon ranges are not detected in sample.

If a sample with a surrogate recovery outside of the acceptable range is not reanalyzed based on any of these aforementioned exceptions, this information must be noted on the data report form and discussed in the Executive Report. Analysis of the sample on dilution may diminish matrix-related surrogate recovery problems. This approach can be used as long as the reporting limits to evaluate applicable MCP standards can still be achieved with the dilution. If not, reanalysis without dilution must be performed.

All criteria were met _	_X
Criteria were not met and/or see below	

VII. A MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. This data alone cannot be used to evaluate the precision and accuracy of individual samples.

At the request of the data user, and in consideration of sample matrices and data quality objectives, matrix spikes and matrix duplicates may be analyzed with every batch of 20 samples or less per matrix.

- Matrix duplicate Matrix duplicates are prepared by analyzing one sample in duplicate. The purpose of the matrix duplicates is to determine the homogeneity of the sample matrix as well as analytical precision. The RPD of detected results in the matrix duplicate samples must not exceed 50 when the results are greater than 5x the reporting limit.
- The desired spiking level is 50% of the highest calibration standard. However, the total concentration in the MS (including the MS and native concentration in the unspiked sample) should not exceed 75% of the highest calibration standard in order for a proper evaluation to be performed. The purpose of the matrix spike is to determine whether the sample matrix contributes bias to the analytical results. The corrected concentrations of each analyte within the matrix spiking solution must be within 70 130% of the true value. Lower recoveries of n-nonane are permissible (if included in the calibration of the C9-C12 aliphatic range), but must be noted in the narrative if <30%.</p>

MS/MSD Recoveries and Precision Criteria

Sample ID:_MC49271-6_MS/MSD_____ Matrix/Level:_Groundwater_____

List the %Rs, RPD of the compounds which do not meet the QC criteria.

The QC reported here applies to the following samples: Method: MADEP VPH REV 1.1

The QC reported here applies to the following samples: Method: MADEP VPH REV 1.1 MC49271-1, MC49271-2, MC49271-3, MC49271-4, MC49271-5, MC49271-6, MC49271-7, MC49271-8, MC49271-10, MC49271-11, MC49271-12, MC49271-13

	MC4927	1-4	Spike	MS	MS	Spike	MSD	MSD		Limits
Compound	ug/l	Q	ug/l	ug/l	%	ug/l	ug/l	%	RPD	Rec/RPD
C5-C8 Aliphatics (Unadj.)	19.7	J	300	417	133* a	300	421	134* a	1	70-130/25

⁽a) Outside control limits due to possible matrix interference.

Note: MS/MSD % recovery and RPD within laboratory control limits except for the cases described in this document. Results for C8- C8 Aliphatics (Unadj.) qualified as estimated (J or UJ) in sample MC49271-4.

^{*} Outside laboratory control limits.

DATA REVIEW WORKSHEETS

No action is taken on MS/MSD results alone to qualify the entire case. However, used informed professional judgment, the data reviewer may use the MS/MSD results in conjunction with other QC criteria and determine the need for some qualification of the data. In those instances where it can be determined that the results of the MS/MSD affect only the sample spiked, the qualification should be limited to this sample alone. However, it may be determined through the MS/MSD results that the laboratory is having a systematic problem in the analysis of one or more analytes, which affects the associated samples.

2. MS/MSD - Unspiked Compounds

List the concentrations of the unspiked compounds and determine the % RSDs of these compounds in the unspiked sample, matrix spike, and matrix spike duplicate.

COMPOUND	CONCENTR. SAMPLE	ATION MS	MSD	%RPD	ACTION
-					

Criteria: None specified, use %RSD ≤ 50 as professional judgment.

Actions:

If the % RSD > 50, qualify the results in the spiked sample as estimate (J). If the % RSD is not calculable (NC) due to nondetect value in the sample, MS, and/or MSD, use professional judgment to qualify sample data.

A separate worksheet should be used for each MS/MSD pair.

All criteria were met _	_X_	
Criteria were not met and/or see below		

VIII. LABORATORY CONTROL SAMPLE (LCS/LCSD) ANALYSIS

This data is generated to determine accuracy of the analytical method for various matrices.

1. LCS Recoveries Criteria

List the %R of compounds which do not meet the criteria

LCS ID	COMPOUND	% R	QC LIMIT	ACTION	
LCS_RE	COVERY_WITHIN_L	ABORATORY	/_CONTROL_LIM	тѕ	
	(A. 300 (A.))	-			

Criteria:

- * Refer to QAPP for specific criteria.
- * The spike recovery must be between 70% and 130%. Lower recoveries of n-nonane are permissible (if included in the calibration of the C9-C12 aliphatic range). If the recovery of n-nonane is <30%, note the nonconformance in the executive narrative.

Actions:

Actions on LCS recovery should be based on both the number of compounds that are outside the %R criteria and the magnitude of the excedance of the criteria.

If the %R of the analyte is > UL, qualify all positive results (j) for the affected analyte in the associated samples and accept nondetects.

If the %R of the analyte is < LL, qualify all positive results (j) and reject (R) nondetects for the affected analyte in the associated samples.

If more than half the compounds in the LCS are not within the required recovery criteria, qualify all positive results as (J) and reject nondetects (R) for all target analyte(s) in the associated samples.

2. Frequency Criteria:

Where LCS analyzed at the required frequency and for each matrix (1 per 20 samples per matrix)? Yes or No.

If no, the data may be affected. Use professional judgment to determine the severity of the effect and qualify data accordingly. Discuss any actions below and list the samples affected. Discuss the actions below:

		All c Criteria were not me	riteria were m et and/or see	
IX.	FIELD/LABORATORY DUPLICATE I	PRECISION		
Sampl	e IDs:		Matrix:	<u>-</u>

Field/laboratory duplicates samples may be taken and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measures only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.

COMPOUND	SQL	SAMPLE CONC.	DUPLICATE CONC.	RPD	ACTION	
No field/laboratory	duplicate	analyzed with this	data package. MS/M	SD % r	ecovery RPD	
			tory and validation gu		document	
criteria (± 50 %) for analytes detected above reporting limits.						

Criteria:

The project QAPP should be reviewed for project-specific information. RPD \pm 30% for aqueous samples, RPD \pm 50 % for solid samples if results are \geq SQL. If both samples and duplicate are \leq 5 SQL, the RPD criteria is doubled.

SQL = soil quantitation limit

Actions:

If both the sample and the duplicate results are nondetects (ND), the RPD is not calculable (NC). No action is needed.

Qualify as estimated positive results (J) and nondetects (UJ) for the compound that exceeded the above criteria.

If one sample result is not detected and the other is $\geq 5x$ the SQL qualify (J/UJ).

Note: If SQLs for the sample and duplicate are significantly different, use professional judgment to determine if qualification is appropriate.

If one sample value is not detected and the other is < 5x the SQL, use professional judgment to determine if qualification is appropriate.

All criteria were met _	_X
Criteria were not met and/or see below	

XI. COMPOUND IDENTIFICATION

The compound identification evaluation is to verify that the laboratory correctly identified target analytes as well as tentatively identified compounds (TICs).

- 1. Verify that the target analytes were within the retention time windows.
 - Retention time windows must be re-established for each Target VPH
 Analyte each time a new GC column is installed, and must be verified and/or
 adjusted on a daily basis.
 - o Coelution of the m- and p- xylene isomers is permissible.
 - o All surrogates must be adequately resolved from individual Target Analytes included in the VPH Component Standard.
 - o For the purposes of this method, adequate resolution is assumed to be achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks.
 - The n-pentane (C5) and MtBE peaks must be adequately resolved from any solvent front that may be present on the FID and PID chromatograms, respectively.

Note: Target analytes were within the retention time window.

2. If target analytes and/or TICs were not correctly identified, request that the laboratory resubmit the corrected data.

All criteria were met _	_X
Criteria were not met and/or see below	

XII. QUANTITATION LIMITS AND SAMPLE RESULTS

The sample quantitation evaluation is to verify laboratory quantitation results.

1. In the space below, please show a minimum of one sample calculation:

MC49271-9

VPH (C9 – C12 Aliphatics) RF =
$$2.125 \times 10^4$$

FID

$$[] = (179816)/(2.125 \times 10^4)$$

$$[] = 8.46 \text{ ppb}$$
 Ok

MC49271-9

VPH (C9 – C10 Aromatics) RF =
$$7.865 \times 10^{3}$$

PID

$$[] = (102854)/(7.865 \times 10^{3})$$

- If requested, verify that the results were above the laboratory method detection limit (MDLs).
- 3. If dilutions performed, were the SQLs elevated accordingly by the laboratory? List the affected samples and dilution factor in the table below.

SAMPLE ID	DILUTION FACTOR	REASON FOR DILUTION
MC49271-12	50 x	C9 – C12 aliphatics over the calibration range.

If dilution was not performed and the results were above the concentration range,	estimate
results (J) for the affected compounds. List the affected samples/compounds:	

EXECUTIVE NARRATIVE

SDG No:

MC49271

Laboratory:

Accutest, Massachusetts

Analysis:

MADEP EPH

Number of Samples:

15

Location:

BMSMC, Building 5 Area

Humacao, PR

SUMMARY:

Fifteen (15) samples were analyzed for Extractable TPHC Ranges by method MADEP EPH. Samples were validated following the METHOD FOR THE DETERMINATION OF EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) quality control criteria, Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets

are from the primary guidance document, unless otherwise noted.

Results are valid and can be used for decision making purposes.

Critical issues:

None

Major:

None

Minor:

None

Critical findings:

None

Major findings:

None

Minor findings:

None

COMMENTS:

Results are valid and can be used for decision making purposes.

Reviewers Name:

Rafael Infante

Chemist License 1888

Signature:

Date:

January 22, 2017

SAMPLE ORGANIC DATA SAMPLE SUMMARY

Sample ID: MC49271-1

Sample location: BMSMC Building 5 Area

Sampling date: 12/21/2016 Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units I	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	+	U	Yes
Ç9 - C18 Aliphatics	110	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	2	U	Yes
Ç11 - C22 Aromatics	110	ug/L	1	-	U	Yes

Sample ID: MC49271-2

Sample location: BMSMC Building 5 Area

Sampling date: 12/21/2016
Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	110	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	110	ug/L	1	-	U	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/21/2016

Matrix: AQ - Field Blank Water

METHOD: MADEP EPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	110	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	110	ug/L	1	-	U	Yes

Sample ID: MC49271-4

Sample location: BMSMC Building 5 Area

Sampling date: 12/22/2016

Matrix: AQ - Equipment Blank

METHOD: MADEP EPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	110	ug/L	1	1-	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	+	U	Yes
Ç11 - C22 Aromatics	110	ug/L	1	(2)	U	Yes

Sample ID: MC49271-5

Sample location: BMSMC Building 5 Area

Sampling date: 12/22/2016 Matrix: Groundwater METHOD: MADEP EPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	110	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	110	ug/L	1	(2	U	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/22/2016 Matrix: Groundwater METHOD: MADEP EPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	48.6	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	110	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	48.6	ug/L	1	J	1	Yes

Sample ID: MC49271-7

Sample location: BMSMC Building 5 Area

Sampling date: 12/22/2016

Matrix: AQ - Field Blank Water

METHOD: MADEP EPH

Analyte Name	Result	Units E	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	100	ug/L	1	7 - 3	U	Yes
Ç9 - C18 Aliphatics	100	ug/L	1	17.5	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-20	U	Yes
C11 - C22 Aromatics	100	ug/L	1	54.9	u	Yes

Sample ID: MC49271-8

Sample location: BMSMC Building 5 Area

Sampling date: 12/22/2016 Matrix: Groundwater METHOD: MADEP EPH

Analyte Name	Result	Units (Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	110	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	-	U	Yes
C11 - C22 Aromatics	110	ug/L	1	-	υ	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/22/2016 Matrix: Groundwater METHOD: MADEP EPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	32.9	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	32.9	ug/L	1	j	J	Yes

Sample ID: MC49271-10

Sample location: BMSMC Building 5 Area

Sampling date: 12/23/2016

Matrix: AQ - Equipment Blank

METHOD: MADEP EPH

Analyte Name	Result	Units E	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	110	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	110	ug/L	1	2.5	U	Yes
Ç19 - C36 Aliphatics	110	ug/L	1	-	U	Yes
C11 - C22 Aromatics	110	ug/L	1		U	Yes

Sample ID: MC49271-11

Sample location: BMSMC Building 5 Area

Sampling date: 12/23/2016

Matrix: AQ - Field Blank Water

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	100	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-	U	Yes
C11 - C22 Aromatics	100	ug/L	1	-	υ	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/23/2016 Matrix: Groundwater METHOD: MADEP EPH

Analyte Name	Result	Units I	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	51.2	ug/L	1	J	J	Yes
Ç9 - C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	45.7	ug/L	1	J	J	Yes

Sample ID: MC49271-13

Sample location: BMSMC Building 5 Area

Sampling date: 12/23/2016 Matrix: Groundwater METHOD: MADEP EPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	100	ug/L	1	-	U	Yes
Ç9 - C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	100	ug/L	1	•	U	Yes

Sample ID: MC49271-6MS

Sample location: BMSMC Building 5 Area

Sampling date: 12/16/2016

Matrix: Groundwater

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	851	ug/L	1	-	•	Yes
Ç9 - C18 Aliphatics	319	ug/L	1	-	•	Yes
Ç19 - C36 Aliphatics	426	ug/L	1	-	-	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/22/2016 Matrix: Groundwater

Analyte Name	Result	Units (Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	842	ug/L	1	-	•	Yes
Ç9 - C18 Aliphatics	316	ug/L	1	•	-	Yes
Ç19 - C36 Aliphatics	421	ug/L	1	-	-	Yes

DATA REVIEW WORKSHEETS

.10.

Type of validation	Full:X Limited:	Project Number:_MC49271
REVIEW OF EXT	RACTABLE PETROLE	EUM HYDROCARBON (EPHs) PACKAGE
validation actions. This more informed decision were assessed accord precedence METHOD HYDROCARBONS (VF (2004). Also the gener Support Section. The Common control of the contr	document will assist the n and in better serving to the data validation FOR THE DETERMPH), Massachusetts Deparal validation guidelines	le organics were created to delineate required reviewer in using professional judgment to make the needs of the data users. The sample results on guidance documents in the following order of MINATION OF EXTRACTABLE PETROLEUM artment of Environmental Protection, Revision 1.1 promulgated by the USEPA Hazardous Wastes ation actions listed on the data review worksheets is otherwise noted.
The hardcopied (labo received has been review for SVOCs included)	ewed and the quality cor	t_Laboratories data package trol and performance data summarized. The data
No. of Samples: Field blank No.: Equipment blank No.: Trip blank No.:	_15 _MC49271-3;_ MC49271 MC49271-4;_MC49271-	Sample matrix:Groundwater
X Data Complet X Holding Times N/A GC/MS Tuning N/A Internal Stand X Blanks X Surrogate Rec X Matrix Spike/N	s g ard Performance coveries	X Laboratory Control SpikesX Field DuplicatesX CalibrationsX Compound IdentificationsX Compound QuantitationX Quantitation Limits
Overall _Extractable_Petroleum	n_Hydrocarbons_by_GC	Comments: _by_Method_MADEP_EPH,_REV_1.1
Definition of Qualifiers:		
J- Estimated result U- Compound not R- Rejected data UJ- Estimated nonde Reviewer: August 22	detected	

		Criteria were no	ot met and/or see below
. DA	ATA COMPLETNE Data Packago		
MISSING	INFORMATION	DATE LAB. CONTACTED	DATE RECEIVED
3. Ot	her		Discrepancies:

All criteria were metX
Criteria were not met and/or see below

HOLDING TIMES

The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of extraction, and subsequently from the time of extraction to the time of analysis.

Complete table for all samples and note the analysis and/or preservation not within criteria

SAMPLE ID	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	ACTION
	SAMELED	EXTRACTED	ANALIZED	
Samples	extracted and an	alyzed within me	thod recommend	ed holding time

Criteria

Preservation:

Aqueous samples must be acidified to a pH of 2.0 or less at the time of collection.

Soil samples must be cooled at 4 ± 2 °C immediately after collection.

Holding times:

Samples must be extracted within 14 days of collection, and analyzed within 40 days of extraction.

Cooler temperature ((Criteria: 4 + 2 °C):	2.9°C

Actions: Qualify positive results/nondetects as follows:

If holding times are exceeded, estimate positive results (J) and nondetects (UJ). If holding times are grossly exceeded, use professional judgment to qualify data. The data reviewer may choose to estimate positive results (J) and rejects nondetects (R). If samples were not at the proper temperature (> 10°C) or improperly preserved, use professional judgment to qualify the results.

		Crite	All criteria eria were not met and/o	a were metX or see below
CALIBRAT	IONS VERIFIC	ATION		
	at the instrum		nstrument calibration producing and mai	
Dat	e of initial calib	ration:12/06	5/16	
Dat	es of initial cali	bration verification:_	12/06/16	
Inst	rument ID num	bers:GCD	E	
Mat	rix/Level;	_AQUEOUS/MEDIUI	M	
DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
	nitial and conti	nuing calibration me	et method specific req	uirements

Criteria- ICAL

- Five point calibration curve.
- The percent relative standard deviation (%RSD) of the calibration factor must be equal to or less than 25% over the working range for the analyte of interest.
 When this condition is met, linearity through the origin may be assumed, and the average calibration factor is used in lieu of a calibration curve.
- A collective calibration factor must also be established for each hydrocarbon range of interest. Calculate the collective CFs for C9-C18 Aliphatic Hydrocarbons, C19-C36 Aliphatic Hydrocarbons, and C11-C22 Aromatic Hydrocarbons using the FID chromatogram. Tabulate the summation of the peak areas of all components in that fraction against the total concentration injected. The %RSD of the calibration factor must be equal to or less than 25% over the working range for the hydrocarbon range of interest.
 - o The area for the surrogates must be subtracted from the area summation of the range in which they elute.
 - The areas associated with naphthalene and 2-methylnaphthalene in the aliphatic range standard must be subtracted from the uncorrected collective C9-C18 Aliphatic Hydrocarbon range area prior to calculating the CF.

Criteria- CCAL

 At a minimum, the working calibration factor must be verified on each working day, after every 20 samples or every 24 hours (whichever is more frequent), and

DATA REVIEW WORKSHEETS

- at the end of the analytical sequence by the injection of a mid-level continuing calibration standard to verify instrument performance and linearity.
- If the percent difference (%D) for any analyte varies from the predicted response by more than ±25%, a new five-point calibration must be performed for that analyte. Greater percent differences are permissible for n-nonane. If the %D for n-nonane is greater than 30, note the nonconformance in the case narrative. It should be noted that the %Ds are calculated when CFs are used for the initial calibration and percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects. If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration:12/06/16
Dates of continuing calibration verification:01/09/17;_01/10/17
Dates of final calibration verification:_12/06/16;_01/09/17;_01/10/17
Instrument ID numbers: GCDE
Matrix/Level:_SOIL/AQUEOUS/MEDIUM

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
lt	nitial and contin	uing calibration meets	method specific req	uirements.
				·

Note:

A separate worksheet should be filled for each initial curve

		C	riteria were not		were met _ ee below	
VA. BLAN	K ANALYSIS R	ESULTS (Sed	ctions 1 & 2)			
magnitude of blanks assoc problems wit evaluated to case, or if the Method Blan	ment of the blace of contamination sisted with the substantial that is any blanks of determine whete problem is any k must be run sample carryove	problems. The amples, inclued amples, inclued at the ample ample ample after sample.	e criteria for eviding trip, equipassociated were is an inhereurrence not afficially suspected of	valuation of bloment, and la ith the case ent variability fecting other of	anks apply boratory bla must be ca in the data lata. A Labe	only to anks. If arefully for the oratory
List the conta separately.	amination in the	blanks belov	v. High and lov	v levels blank	s must be t	reated
Laboratory bl	anks					
DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND		NCENTRA ITS	TION
_METHOD	BLANKS M	EET THE	METHOD	SPECIFIC	CRITERIA	
Note:			S			
Field/Trip/Eq	uipment					
DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CO	NCENTRA TS	TION
_NO_TARGE _ANALYZED	T_ANALYTES_ _FOR_THIS_D/	DETECTED_ ATA_PACKA	IN_THE_FIEL 3E_	D/EQUIPMEN	IT_BLANK_	
	108 12 12 13 10 12 12 13 13 13 13 13 13 13 13 13 13 13 13 13					
Note:						

All criteria were metX
Criteria were not met and/or see below

V B. BLANK ANALYSIS RESULTS (Section 3)

Blank Actions

The ALs for samples which have been diluted should be corrected for the sample dilution factor and/or % moisture, where applicable. Peaks must not be detected above the Reporting Limit within the retention time window of any analyte of interest. The hydrocarbon ranges must not be detected at a concentration greater than 10% of the most stringent MCP cleanup standard. Specific actions area as follows:

If the concentration is < sample quantitation limit (SQL) and < AL, report the compound as not detected (U) at the SQL.

If the concentration is \geq SQL but < AL, report the compound as not detected (U) at the reported concentration.

If the concentration is > AL, report the concentration unqualified.

All criteria were met	X
Criteria were not met and/or see below	

SURROGATE SPIKE RECOVERIES

Laboratory performance of individual samples is established by evaluation of surrogate spike recoveries. All samples are spiked with surrogate compounds prior to sample analysis. The accuracy of the analysis is measured by the surrogate percent recovery. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the validation of data is frequently subjective and demands analytical experience and professional judgment.

List the percent recoveries (%Rs) which do not meet the criteria for surrogate recovery. Matrix: solid/aqueous

SAMPLE ID	SURROGATE COMPOUND				ACTION	
	S1	S2	S3	S4		
SURROGATE _LIMITS_EXCE	STANDARI PT_FOR_TI	DS_RECOVER HE_CASES_D	RIES_WITHIN_ ESCRIBED_IN	LABORATOR' _THIS_DOCU	Y_CONTROL MENT	

Note: 1-Chlorooctadecane recovered outside laboratory control limits in samples MC49271-1; -2; -5; and -6. Outside control limits due to possible matrix interference. Confirmed by refractionation/reanalysis.

It is recommended that surrogate standard recoveries be monitored and documented on a continuing basis. At a minimum, when surrogate recovery from a sample, blank, or QC sample is less than 40% or more than 140%, check calculations to locate possible errors, check the fortifying standard solution for degradation, and check changes in instrument performance.

If the cause cannot be determined, reanalyze the sample unless one of the following exceptions applies:

- (1) Obvious interference is present on the chromatogram (e.g., unresolved complex mixture);
- (2) The surrogate exhibits high recovery and associated target analytes or hydrocarbon ranges are not detected in sample.

If a sample with a surrogate recovery outside of the acceptable range is not reanalyzed based on any of these aforementioned exceptions, this information must be noted on the data report form and discussed in the Executive Report. Analysis of the sample on dilution may diminish matrix-related surrogate recovery problems. This approach can be used as long as the reporting limits to evaluate applicable MCP standards can still be achieved with the dilution. If not, reanalysis without dilution must be performed.

All criteria were met _X
Criteria were not met and/or see below

VII. A MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. This data alone cannot be used to evaluate the precision and accuracy of individual samples.

At the request of the data user, and in consideration of sample matrices and data quality objectives, matrix spikes and matrix duplicates may be analyzed with every batch of 20 samples or less per matrix.

- Matrix duplicate Matrix duplicates are prepared by analyzing one sample in duplicate. The purpose of the matrix duplicates is to determine the homogeneity of the sample matrix as well as analytical precision. The RPD of detected results in the matrix duplicate samples must not exceed 50 when the results are greater than 5x the reporting limit.
- The desired spiking level is 50% of the highest calibration standard. However, the total concentration in the MS (including the MS and native concentration in the unspiked sample) should not exceed 75% of the highest calibration standard in order for a proper evaluation to be performed. The purpose of the matrix spike is to determine whether the sample matrix contributes bias to the analytical results. The corrected concentrations of each analyte within the matrix spiking solution must be within 40 140% of the true value. Lower recoveries of n-nonane are permissible but must be noted in the narrative if <30%.</p>

MS/MSD Recov	veries and Precision Crite	eria			
Sample ID:_MC	49271-6_MS/MSD		Matrix	:/Level:Ground	dwater
List the %Rs, R	PD of the compounds wh	nich do no	t meet t	he QC criteria.	
MS OR MSD	COMPOUND	% R	RPD	QC LIMITS	ACTION
					

Note: MS/MSD and RPD within laboratory control limits.

All criteria were met>	<u></u>
Criteria were not met and/or see below	

No action is taken on MS/MSD results alone to qualify the entire case. However, used informed professional judgment, the data reviewer may use the MS/MSD results in conjunction with other QC criteria and determine the need for some qualification of the data. In those instances where it can be determined that the results of the MS/MSD affect only the sample spiked, the qualification should be limited to this sample alone. However, it may be determined through the MS/MSD results that the laboratory is having a systematic problem in the analysis of one or more analytes, which affects the associated samples.

2. MS/MSD - Unspiked Compounds

List the concentrations of the unspiked compounds and determine the % RSDs of these compounds in the unspiked sample, matrix spike, and matrix spike duplicate.

COMPOUND	CONCENTRA SAMPLE	ATION MS	MSD	%RPD	ACTION
			_		
	_				
75 + 3625 + 2 + 450					- C 10 - S 2 1000 - 25
		-			
	CONTRACTOR OF THE CONTRACTOR O				

Criteria: None specified, use %RSD ≤ 50 as professional judgment.

Actions:

If the % RSD > 50, qualify the results in the spiked sample as estimate (J). If the % RSD is not calculable (NC) due to nondetect value in the sample, MS, and/or MSD, use professional judgment to qualify sample data.

A separate worksheet should be used for each MS/MSD pair.

		Criteria were not met and/or see below
	VIII.	LABORATORY CONTROL SAMPLE (LCS/LCSD) ANALYSIS
matrice		ata is generated to determine accuracy of the analytical method for various
	1.	LCS Recoveries Criteria
		List the %R of compounds which do not meet the criteria
LCS ID)	COMPOUND % R QC LIMIT ACTION
_LCS/l _THE_	_CSD_F CASES	RECOVERY_WITHIN_LABORATORY_CONTROL_LIMTS_EXCET_FOR_ S_DESCRIBED_IN_THIS_DOCUMENT
	Note:	C9-C18 aliphatics LCS/LCS % recovery RPD within laboratory control limits. Recovery of n-nonane was <30% for the laboratory control simple. No action taken, professional judgment.
	Criteria	
	*	Refer to QAPP for specific criteria. The spike recovery must be between 40% and 140%. Lower recoveries of n-nonane are permissible. If the recovery of n-nonane is <30%, note the nonconformance in the executive narrative. RPD between LCS/LCSD must be < 25%.
		s on LCS recovery should be based on both the number of compounds outside the %R and RPD criteria and the magnitude of the excedance of
the ass If the % for the If more qualify	ociated 6R of that affected than h	ne analyte is > UL, qualify all positive results (j) for the affected analyte in I samples and accept nondetects. The analyte is < LL, qualify all positive results (j) and reject (R) nondetects analyte in the associated samples. The compounds in the LCS are not within the required recovery criteria, itive results as (J) and reject nondetects (R) for all target analyte(s) in the imples.
2.	Freque	ency Criteria:
per ma If no, ti the effe	trix)? <u>Y</u> ne data ect and	nalyzed at the required frequency and for each matrix (1 per 20 samples es or No. may be affected. Use professional judgment to determine the severity of qualify data accordingly. Discuss any actions below and list the samples uss the actions below:

		Crite	All criteria eria were not met and		netN/A below
IX. FIELD/LA	BORATOR	Y DUPLICATE PR	ECISION		
Sample IDs:			Matrix:		
Field/laboratory duplicates samples may be taken and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measures only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.					
COMPOUND	SQL	SAMPLE CONC.	DUPLICATE CONC.	RPD	ACTION
		-			
	recision. R	PD within laborato	data package. MS/M ry and generally acce bed in this document	eptable	
		3			
Criteria:					
The project QAPP should be reviewed for project-specific information. RPD \pm 30% for aqueous samples, RPD \pm 50% for solid samples if results are \geq SQL. If both samples and duplicate are $<$ 5 SQL, the RPD criteria is doubled.					
SQL = soil quantitation limit					
Actions:					
If both the sample and the duplicate results are nondetects (ND), the RPD is not calculable (NC). No action is needed.					
Qualify as estimated positive results (J) and nondetects (UJ) for the compound that exceeded the above criteria.					
If one sample result is not detected and the other is $\geq 5x$ the SQL qualify (J/UJ).					

Note: If SQLs for the sample and duplicate are significantly different, use professional

If one sample value is not detected and the other is < 5x the SQL, use professional judgment to determine if qualification is appropriate.

judgment to determine if qualification is appropriate.

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All criteria were metX
Criteria were not met and/or see below

XI. COMPOUND IDENTIFICATION

The compound identification evaluation is to verify that the laboratory correctly identified target analytes as well as tentatively identified compounds (TICs).

- 1. Verify that the target analytes were within the retention time windows.
 - Retention time windows must be re-established for each Target EPH
 Analyte each time a new GC column is installed, and must be verified and/or adjusted on a daily basis.
 - o The n-nonane (n-C9) peak must be adequately resolved from the solvent front of the chromatographic run.
 - o All surrogates must be adequately resolved from the Aliphatic Hydrocarbon and Aromatic Hydrocarbon standards.
 - For the purposes of this method, adequate resolution is assumed to be achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks.
 - o The n-pentane (C5) and MtBE peaks must be adequately resolved from any solvent front that may be present on the FID and PID chromatograms, respectively.
- 1a. Aliphatic hydrocarbons range:
 - o Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for n-C9 and 0.01 minutes before the Rt for n-C19.
 - o Determine the total area count for all peaks eluting 0.01 minutes before the Rt for n-C19 and 0.1 minutes after the Rt for n-C36.

Are the aliphatic hydrocarbons range properly determined?

Yes? or No?

Comments:

- 1b. Aromatic hydrocarbons range:
 - Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for naphthalene and 0.1 minutes after the Rt for benzo(g,h,i)perylene.
 - Determine the peak area count for the sample surrogate (OTP) and fractionation surrogate(s). Subtract these values from the collective area count value.

Are the aliphatic hydrocarbons range properly determined?

Yes? or No?

Comments:

Comments: Not applicable.

	All criteria were metX Criteria were not met and/or see below
2.	If target analytes and/or TICs were not correctly identified, request that the laboratory resubmit the corrected data.
3.	Breakthrough determination - Each sample (field and QC sample) must be evaluated for potential breakthrough on a sample specific basis by evaluating the % recovery of the fractionation surrogate (2-bromonaphthalene) and on a batch basis by quantifying naphthalene and 2-methylnaphthalene in both the aliphatic and aromatic fractions of the LCS and LCSD. If either the concentration on naphthalene or 2-methylnaphthalene in the aliphatic fraction exceeds 5% of the total concentration for naphthalene or 2-methylnaphthalene in the LCS or LCSD, fractionation must be repeated on all archived batch extracts.
	NOTE: The total concentration of naphthalene or 2 methylnaphthalene in the LCS/LCSD pair includes the summation of the concentration detected in the aliphatic fraction and the concentration detected in the aromatic fraction.
	Comments:Concentration_in_the_aliphatic_fraction_<_5%_of_the_totalconcentration_for_naphthalene_and_2-methylnaphthalene
4.	Fractionation Check Standard – A fractionation check solution is prepared containing 14 alkanes and 17 PAHs at a nominal concentration of 200 ng/µl of each constituent. The Fractionation Check Solution must be used to evaluate the fractionation efficiency of each new lot of silica gel/cartridges, and establish the optimum hexane volume required to efficiently elute aliphatic hydrocarbons while not allowing significant aromatic hydrocarbon breakthrough. For each analytic contained in the fractionation check solution, excluding n-nonane, the Percen Recovery must be between 40 and 140%. A 30% Recovery is acceptable for nonane.
	Is a fractionation check standard analyzed? Yes? or No?

All criteria were met _	_X	
Criteria were not met and/or see below		

XII. QUANTITATION LIMITS AND SAMPLE RESULTS

The sample quantitation evaluation is to verify laboratory quantitation results.

In order to demonstrate the absence of aliphatic mass discrimination, the response ratio of C28 to C20 must be at least 0.85. If <0.85, this nonconformance must be noted in the laboratory case narrative.

The chromatograms of Continuing Calibration Standards for aromatics must be reviewed to ensure that there are no obvious signs of mass discrimination.

Is aliphatic mass discrimination observed in the sample?

Yes? or No?

Is aromatic mass discrimination observed in the sample?

Yes? or No?

1. In the space below, please show a minimum of one sample calculation:

MC49271-1

EPH (C11 – C22, Aromatics)

RF = 99940

[] = (1162102)/(99940)

[] = 11.63 ppb Ok

EPH (C19 - C36, Aliphatics)

RF = 67800

[] = (466567)/(67800)

[] = 6.88 ppb Ok

All criteria were met	_X
Criteria were not met and/or see below	1

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